

Chapter 6: Grants, Loans, and Tax Incentives

As described in Chapter 1, aggressive expansion of a clean biofuels industry holds the promise of jobs and economic growth as part of a larger clean energy sector that capitalizes on Massachusetts's advantages in technology, venture capital, sustainable forestry and a highly skilled workforce. In addition, advanced biofuels offer the prospect of environmental benefits in the form of reduced greenhouse gas emissions as they displace the use of imported petroleum in our engines and furnaces. Reducing oil imports is also vital to the energy security of the U.S. as a whole. To realize this promise of global leadership, job creation and retention, economic growth, and environmental benefits, Massachusetts should begin rigorous benefit-cost analysis to identify the best financial tools to develop the sector. Such an effort must necessarily account for revenue impacts and direct and indirect environmental impacts.

As a general matter, state governments have the ability to use their own financial resources to aid particular industries whose growth they see as being in the public interest. Generally, the instruments at their disposal for this purpose include grants, loans, and the state tax code. Massachusetts has used these tools in recent years to provide targeted assistance in a number of areas, including for manufacturers, R&D companies, biotechnology, and the film industry. This chapter discusses the applicability of these options to the emerging biofuels industry, and makes recommendations about how to tailor state financial incentives to maximize the industry's potential in the Bay State.

At the outset, it is important to note that such policies must be considered carefully:

- investments should be made strategically, playing to the Commonwealth's comparative advantages in technology R&D, venture capital, sustainable feedstock sectors and a highly skilled workforce;
- the Commonwealth has limited financial resources and is currently facing a challenging budgetary situation;
- economic development incentives may or may not yield new tax revenues equal to their impact on the state's budget; and
- the broader benefits of particular subsidies, including jobs and environmental gains, must be analyzed in relation to their costs, so that these policies can be compared with other means of using state funds to achieve important goals.

Most existing federal and state-level biofuel subsidies and incentives are designated for first generation biofuels, primarily corn-based ethanol and soy-based biodiesel. Such policies are common in states with large agricultural sectors, but would offer few economic benefits in Massachusetts. This chapter will discuss these existing policies in other states, since available evidence on the effectiveness of subsidy policies relates mainly to them.

But "advanced," or cellulosic-based, fuels are more promising candidates for support from the Commonwealth, since Massachusetts has a greater ability to lead in the technological

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development of such fuels, and to supply feedstock for the production of these fuels locally.¹ Further, federal law now requires 21 billion gallons of advanced biofuel use per year by 2022, starting with smaller volumetric requirements in 2010.

Financial support for biofuels can be directed toward either companies or consumers. When directed at businesses, state incentives would make it easier for biofuel companies to locate, finance, and expand their operations here, creating jobs and economic opportunity. When

directed at consumers, state incentives would stimulate demand for the industry's products, facilitating the growth of biofuel companies and capturing the benefits of lower greenhouse gas emissions and fewer petroleum imports. Separately or in tandem, state incentives for companies and consumers could help make advanced biofuels an integral part of the growing clean energy economy in Massachusetts.

Massachusetts is already home to many of the leading companies developing second-generation fuels and chemicals from biomass. It is critical for Massachusetts to attract and retain these businesses if the Bay State is to lead the global growth of the advanced biofuels sector.

This chapter reviews existing financial incentives for the development and use of biofuels in federal law, as well as those adopted by other states. It also discusses the existing financial support mechanisms for business development in Massachusetts that could benefit the biofuels industry, as well as biofuels-specific incentives that the Commonwealth might consider. Given constraints on the state budget, new financial incentives in the near term are likely to be limited, and will be best used to pursue opportunities that offer the greatest economic and environmental benefits at the lowest cost.

Existing Biofuels Incentives

At both the federal and state levels, biofuels receive a range of financial supports and incentives.

Incentives in Federal Law

Federal law currently offers large tax incentives for biofuels. A 51-cent excise tax credit is provided to oil companies for each gallon of ethanol blended into gasoline, while biodiesel from “virgin” crop sources is eligible for a \$1 per gallon credit and biodiesel from waste oil gets a 50-cent credit.² The new federal energy law requires that a large portion of transportation fuel consumed in the United States come from biofuels in the future. Specifically, 15 billion gallons a year of corn-based ethanol is required by 2015 (the 15 billion gallon standard extends through 2022), and 21 billion gallons of “advanced” biofuels by 2022, of which 16 billion must be cellulosic. Additional federal incentives or requirements may be implemented to reach mandated levels of biofuel use.³

There may also be substantial R&D funding available, subject to federal appropriations, which could benefit Massachusetts and other states, as described in several sections of Title II of the Energy Independence and Security Act of 2007. This includes advanced biofuel production grants, R&D grants, cellulosic ethanol and biofuels research, bioenergy research centers, and renewable infrastructure grants.⁴

Incentives Adopted by Other States

Many states have adopted tax incentives for ethanol and biodiesel, including tax credits or deductions for production (about 20 states), investment tax credits for production facilities (about 10 states), excise tax exemptions, and infrastructure incentives (about 12 states).⁵ In most cases, these states are large growers of corn or soybeans, and in some cases the incentives (or mandates, see Chapter 4) are linked to use of in-state feedstocks. For example, Washington State provides a tax deduction to companies on sale



of biodiesel and E85 fuels. In Illinois, biodiesel blends from B1 through B10 are subject to sales tax rates 20% below that imposed on gasoline, while higher blends of biodiesel are exempt from sales tax altogether.

In the Northeast, biofuel incentives are less extensive, but several states do offer them. Of the 11 Northeast states, four have production tax credits or deductions and four have infrastructure incentives, while none have credits for investment in production facilities. Maine has a 5-cent per gallon income tax credit for in-state production of biofuels, but no company has claimed it to date. Maine also has a tax credit on the books for investments in biofuel pumps at retail gasoline stations, but it is unavailable at present due to a lack of state appropriations. Connecticut provides production payments for biodiesel producers, as well as a 50% tax credit for investments in compressed natural gas, liquefied natural gas, and liquefied petroleum gas filling stations. In Rhode Island, “organic” biodiesel is exempt from the motor fuel tax.

New Jersey’s tax rate on liquefied petroleum gas and compressed natural gas is half that levied on gasoline. Maryland offers a tax credit of 20 cents per gallon for in-state production of ethanol made from grain, 5 cents if made from other products, and 20 cents for biodiesel made from soybeans at an in-state crushing facility.

Apart from fuels and infrastructure, several states provide incentives for purchasers of alternative-fuel or hybrid vehicles. Connecticut exempts compressed natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen, and electric vehicles from the state sales tax, along with hybrids that are rated at 40 miles per gallon or more. New Jersey provides incentives of up to \$4,000 for local governments that buy alternative-fuel or hybrid light-duty vehicles, and up to \$2,000 for flex-fuel vehicles. New Jersey also exempts zero-emission vehicles from sales and use taxes.⁶

There are several tax and regulatory incentives in place in New York, including a tax credit of up to 15 cents per gallon for in-state biodiesel or ethanol production and reimbursement for up to 50% of the costs of installing fueling infrastructure, capped at to \$50,000 per site. E85, CNG, and hydrogen are all exempt from state fuel taxes, and the tax on biodiesel is reduced. New York has recently announced a re-evaluation of its policies towards biofuels, however, and may reconsider its financial incentives. The state will conduct a study on the environmental and other impacts of particular feedstocks and develop a “roadmap” for state policy on renewable fuels.⁷ On February 25, 2008, a task force on renewable energy led by the lieutenant governor issued a report stating, “Of particular concern is the current shortage of widely accepted environmental and public health data relative to emissions and land use impacts associated with renewable fuel use.”⁸

The New York task force commented further that “current state policy on renewable fuels is not adequate and that no single renewable fuel will answer the increasing energy needs of the state. New York should address critical concerns regarding the specific fuels we may use—both to solve our energy mandates, and to prioritize environmental, land-use and health concerns in policy-decision making.”

New York does, nevertheless, expect that re-focused policies will be valuable: “[...]since all of [petroleum] fuels are imported to New York, a substantial portion of the energy expenditures in New York is directed out of state. A carefully crafted renewable fuel policy can reduce this loss, enhance the environment, and create economic opportunities for New Yorkers.”⁹

Biofuels And Economic Development in Other States

Existing state and federal policies to support first-generation biofuels have several goals: to aid domestic agricultural producers, reduce gasoline imports, and provide environmental

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benefits. Several industry- and state-sponsored studies have indicated that government subsidies can help bring about expansion of the industry, with large benefits in terms of jobs and in-state economic growth. A study for South Dakota, for example, estimated 3,000 jobs gained for the state, while one for Iowa, the largest corn-growing state, estimated 96,000 jobs.¹⁰

But these studies should be viewed with caution. First, their results for crop-dependent states may not be applicable to Massachusetts, where use of in-state feedstock is less likely. For example, one national study estimated that ethanol production created 195,000 U.S. jobs, but of these the vast majority were due to growing feedstock, with only 13,000 related to the operation of processing plants.¹¹ Another, more recent study estimated that, for a 100 million gallon per year ethanol plant, 50 people would be employed at the plant itself, but that total jobs gained in the state would be 1,790 (including a large multiplier effect).¹²

Second, sometimes such studies exaggerate expected benefits relative to costs. For example, the more recent study referred to above estimated that \$109 million in spending within the state related to a 100 million gallon/year plant (including growing feedstock) would yield \$300 million in the state's economic output—implying an output multiplier of 2.75. Such a multiplier is appropriate at the national level, but is substantially overstated for state level impacts, where a higher percentage of indirect spending goes out-of-state (we use 1.9 as an output multiplier for Massachusetts in Chapter 1 of this report, based on results of the IMPLAN model).¹³ Another study, for Minnesota, used a multiplier of 7.2 to convert from direct jobs to total jobs—far higher than the employment multiplier of 2.3 that we use for Massachusetts in Chapter 1 of this report.¹⁴

Studies from other states do shed some light on the efficacy of incentives: even if their multipliers and/or other forecasting parameters

are not appropriate for Massachusetts, there will be economic gains from utilizing local feedstocks and from manufacturing fuel in the Commonwealth. The analysis presented in Chapters 1 and 3 estimates substantial economic benefits given a significant build-out of the advanced biofuels sector, based on the specific strengths and barriers involved in Massachusetts developing this industry. But clearly, more complete benefit-cost analysis is required. We have not, for example, forecasted the impacts of adopting particular incentive policies in the Commonwealth. Such analysis should be done in a rigorous manner in order for the Commonwealth to make decisions on the most cost-effective and efficient use of its limited budgetary resources.

Costs of Climate Benefits

New York's reconsideration of incentives on the grounds of cost and environmental effectiveness highlights a broader challenge in biofuels support: the costs of policies to reduce greenhouse gas emissions shouldered by both consumers and governments can vary greatly. Some analysts argue that current federal and state biofuels policies carry a high cost per ton of emissions reduced relative to other measures, such as fuel efficiency standards. This is not surprising as climate goals were not a driving objective during the formulation of the range of corn-based ethanol subsidies. However, given the need for society to cut emissions by a large percentage while minimizing economic costs, and the Commonwealth's limited financial resources, it is important to prioritize policies that yield the greatest emissions reductions per dollar.

At present, Massachusetts is focusing much of its energy policy efforts on improving the efficiency of buildings, products, and vehicles, all of which reduce greenhouse gas emissions at negative costs—meaning that they actually save consumers money. Massachusetts also supports renewable sources of electricity, using policies that favor the most cost-effective alternatives.

Given the need for society to cut emissions while minimizing economic costs, and the Commonwealth's limited financial resources, it is important to prioritize policies that yield the greatest emissions reductions per dollar.

These include the state's Renewable Portfolio Standard, which allows electricity suppliers to meet minimum renewable energy requirements with the least-expensive eligible energy source available, and the Regional Greenhouse Gas Initiative (RGGI), which will use a cap-and-trade mechanism to let the market identify the most cost-effective means of reducing emissions. Forecasts for RGGI estimate that the high end of the cost to reduce carbon dioxide emissions is approximately \$10 per ton, and is likely to be much lower. (The reserve price for the first auction of emissions allowances, in September 2008, is set at \$1.86 per ton.)

If one looks at existing federal policies on biofuels solely in terms of expected reductions in greenhouse gas emissions and oil consumption, these policies appear to have much higher costs relative to their benefits than do the Massachusetts energy policies discussed above. A January 2008 paper written for the National Bureau of Economic Research by Tufts University economist Gilbert Metcalf estimated that the federal tax credit for corn-based ethanol cost U.S. taxpayers \$1,700 per ton of carbon dioxide avoided in 2006, and reduced oil consumption at a cost of over \$85 a barrel.¹⁵ An earlier study done for the international Organization for Economic Cooperation and Development (OECD), which was critical of the high level of biofuel subsidies in its member states, estimated ethanol subsidies in the U.S. at \$545 per ton of greenhouse gas emissions reduced and between \$590 and \$4,520 per ton in the European Union (depending on the country).¹⁶ Testimony submitted to the Advanced Biofuels Task Force by Earth Track estimated that U.S. federal biodiesel subsidies total \$1.80 to \$2.20 per gallon.¹⁷ Even if biodiesel eliminated 100% of the carbon dioxide emissions from petroleum diesel, this would be a cost of about \$200 per ton of emissions.

Even these cost numbers per ton of emissions could be low, because the lifecycle greenhouse-gas reducing potential of crop-based fuels

is uncertain at present and more definitive answers will probably not be available for a year or more (as discussed in Chapter 2). Without this information, it is difficult for Massachusetts to evaluate the benefits and costs of policies to subsidize first-generation (crop-based) biofuels in order to provide a bridge to cellulosic fuels. As a result, it is important to proceed with caution while the scientific evidence is being developed.

To date, however, the available scientific evidence suggests that cellulosic fuels will yield much greater greenhouse gas reductions per gallon of fuel than do the current crop-based fuels. If this turns out to be the case (cellulosic fuel not yet being commercially available), then the costs of government assistance per ton of greenhouse gases reduced would be much lower than for corn-based ethanol and soy-based biodiesel—and we can have more confidence that incentive policies to aid them will yield the desired environmental results in a cost-effective manner.



Economic Development Programs in Massachusetts

Massachusetts presently offers a number of financial support programs to encourage business development. Like other companies that can qualify for particular programs or benefits, biofuels companies, can and already do avail themselves of these programs. These range from grants and loans to tax credits.

General Tax Incentives for Business Investment

There are several general tax incentives intended to aid developing businesses or to encourage companies to locate in Massachusetts and/or remain here. For instance, all corporate manufacturers are eligible for an income tax credit equal to 3 percent of their qualifying

investments in the state. In addition, a business that agrees to specific levels of investment and job retention in communities that are designated as Economic Target Areas can become a “certified project” through the Economic Development Incentive Program and increase its tax credit to 5 percent (Economic Opportunity Area Credit).

Companies that engage in renovation or expansion of their facilities in Economic Target Areas can also obtain exemptions on all or part of their real estate taxes for five to 20 years. These agreements, which are negotiated with municipalities, are known as Tax Increment Financing agreements. In addition to the real estate taxes, the businesses automatically

receive an exemption from 100% of local “personal property taxes”—taxes on equipment in facilities.

Massachusetts also currently offers other tax advantages to companies, particularly corporate manufacturers and so-called R&D corporations. Certain equipment used by such corporations for manufacturing and R&D is exempt from sales and use

taxes. In addition, the state provides highly favorable tax treatment of R&D expenses: certain costs that qualify for the federal R&D tax credit are also eligible for a 10% Massachusetts tax credit.

Finally, Massachusetts uses the “single sales factor” method of apportioning income for manufacturing corporations that are subject to tax in multiple states. For manufacturers, the state corporate excise tax applies to that portion of total net income that is determined by applying the ratio of in-state sales to total sales, without taking into account the proportion of payroll or property in the state. This can be a significant tax advantage to companies operating on a national or international scale that have or want to locate and invest in personnel and facilities in Massachusetts.



Grants

Existing state grant programs are very limited and targeted to specific business-related needs that contribute to economic development.

The Public Works Economic Development program, managed by the Executive Office of Transportation and Public Works, assists municipalities in funding transportation infrastructure that will stimulate economic development. These funds can be used for investments such as intersection improvements, which may be needed for specific development projects to move forward. Grants are awarded to municipalities, which implement the infrastructure projects.

The Workforce Training Fund, managed by the Executive Office of Labor and Workforce Development, provides resources to Massachusetts businesses and workers to train their employees. Companies that contribute to the state’s unemployment insurance fund are eligible to apply for the program. Grant funds are made available to these companies provided that they match the grant value with their own contributions.

The Massachusetts Renewable Energy Trust, which is managed by the Massachusetts Technology Collaborative, provides loans and grants to support start-up renewable energy companies. Funds from the Trust, which come from charges on electric utility bills, are for the most part restricted to renewable energy technologies that produce electricity. Under limited circumstances, biofuels companies might be eligible for support from the Renewable Energy Trust.

Loans

The Emerging Technology Fund, which is managed by MassDevelopment, offers financing on favorable terms to technology companies preparing to commercialize their products or processes. Loans of up to \$2.5 million are available for facilities and up to \$500,000 for

equipment, but may not exceed 25% of total project costs.

MassDevelopment also manages other loan programs for real estate and equipment for credit-worthy, revenue-generating companies. Real estate loans may be provided up to \$3 million or 90% of property value. Equipment loans may reach \$500,000, not to exceed 85% of the cost of new equipment.

MassDevelopment also offers tax-exempt bonds, which provide low interest rate loans for capital projects. Projects must be eligible for tax-exempt funding under the federal tax code. These rules impose limits on the total capital investment at a given site for a period spanning three years before the bond issue through three years after the project is completed.

Limitations of Current Tax, Grant, and Loan Assistance for Biofuels

Many companies in the rapidly growing biofuels sector are very small, early-stage enterprises. For the most part, these companies are engaged in developing new technologies, and have yet to generate revenue. In some cases, these firms enjoy substantial venture capital funding, which brings with it pressure to stretch their resources. Their needs for state support often relate to early-stage business development, research, and pilot manufacturing facilities.

Except for MassDevelopment's Emerging Technology Fund and certain sales and use tax exemptions for purchases of equipment by companies qualifying as research and development corporations, the Commonwealth's current economic development tools are limited in terms of benefits for early-stage biofuels companies. These companies are pre-profit, leaving the value of income (corporate excise) tax incentives unclaimable in the near term and loans unavailable because they are limited to credit-worthy, revenue-generating companies. The value of investment tax

credits is not immediately available, but may be carried forward into the future. As for the Economic Development Incentive Program, small companies plan relatively small projects, limiting the impact of this program. Once negotiated with a municipality, the value of tax increment financing is available immediately, but that value is limited by the small increase in real estate value at the site.

Prospective Massachusetts Biofuels Policies

Cellulosic Ethanol Gasoline Tax Exemption

In November, Governor Patrick, Senate President Therese Murray, and House Speaker Salvatore DiMasi announced their support for legislation to promote the development of renewable biofuels in Massachusetts.

The bill would exempt cellulosic ethanol from the state's gasoline tax, but, since cellulosic fuel is not yet available, this would have no immediate impact on revenues. However, this preferential tax treatment would provide an incentive for companies that are engaged in efforts to make cellulosic ethanol commercially viable to bring their products to market as quickly as possible, and to do so in Massachusetts.

Based on a wide range of testimony during the Task Force deliberations, several changes to the bill as filed seem constructive. First, any fuel that qualifies should have to provide substantial reductions in greenhouse gas emissions relative to gasoline, evaluated on a lifecycle basis, including both direct and indirect impacts for both fuels being compared. Second, focusing just on ethanol is too narrow, as new technologies are currently being developed to use cellulosic feedstocks to produce non-ethanol replacements for petroleum gasoline. Therefore, the tax exemption should apply generally to cellulose-derived biofuel that is an alternative to gasoline.

The best way for Massachusetts to drive economic development through encouraging biofuels is by nurturing and growing the already significant cluster of advanced biofuels technology companies in the state.

—Nathanael Greene, Senior Policy Analyst, Natural Resources Defense Council, testimony to the Massachusetts Advanced Biofuels Task Force, January 17, 2008

Financial incentives for producers and consumers of biofuels should be phased out with implementation of a Low Carbon Fuel Standard, which will provide durable incentives to achieve greenhouse gas reductions and displacement of petroleum fuels at the lowest cost to consumers. However, R&D incentives may have a longer-term role in state support for the industry.

Production Tax Credit for Massachusetts Biofuels

Direct economic development benefits to Massachusetts from biofuels come in part from displacing imports of petroleum fuel, but also from production of the fuels themselves. One way to target tax incentives for local production would be to provide a production tax credit to companies on their state income (corporate excise) taxes. Since there is little production in the state at present, such credits would only provide incentives for new production, and therefore should not materially reduce current revenues.

As most of the current biofuels activity in Massachusetts is centered on technology development, which is often pre-profit, the goal should be to incentivize early establishment of demonstration and commercial facilities in the state. This should include activities related to eventual fuel production, such as transition and growth of materials, in order to encourage development of feedstock infrastructure for advanced biofuels.

To better assist such early-stage, pre-profit firms and not-for-profit firms, the state should study making tax credits refundable (whereby companies without profits, and thus without current taxes to offset, could get tax rebates) or transferable (whereby tax credits could be sold to other firms that could use such credits to reduce their taxes). However, refundability or transferability would serve to reduce the state's tax revenues relative to then-current levels, and so would need to be evaluated carefully in light of the state's budgetary situation.

The economic benefit to the state would be even greater if this production involved Massachusetts feedstocks (as many crop-producing states have realized), and so the credit could be limited to such feedstocks. Another possible boon for Massachusetts would be to target tax benefits to the biofuel use of waste feedstocks that are not practical

to recycle—and where air and water quality is not compromised—because of their local development potential, likely environmental benefits, and limited federal tax benefits compared with fuel from virgin feedstocks.

While several biodiesel production facilities are already planned for the state, suggesting the economics for these facilities are positive, production tax credits should be analyzed and considered. In addition, a credit based on the use of local feedstock could encourage the companies to shift from using sources such as soybeans or palm oil to making more use of the limited in-state sources, such as waste oils. The state could cap tax credits per facility or per company in order to control potential costs to the state budget.

As for cellulosic fuel, while Massachusetts has inherent advantages for the R&D phase of the industry, it is too early to know whether production facilities would locate here, or whether they would use in-state feedstocks (such as wood waste) without specific incentives. These questions require further research and analysis as the industry matures, but such incentives should be considered.

Tax Credit for Feedstock from Sustainably Managed Forests

Chapter 3 on biofuel feedstocks discusses the possibility of a tax credit for wood used for biofuels and biomass if it is derived from sustainably managed forests. At present, wood from land cleared for development has a market advantage over wood from managed forests, despite the greenhouse gas implications and other disadvantages of clearing new land.

To pursue such a policy, it is necessary to consider the costs and benefits of implementing state tax credits for biofuel and biomass feedstocks from in-state managed forests. This analysis should weigh the potential benefits of tax incentives for reducing greenhouse gas emissions, developing this sector of the biofuels feedstock market, and helping to maintain the

Commonwealth's working landscapes, against the cost to the state budget.

Policy Recommendations:

1. Exempt cellulosic biofuels from the state's gasoline tax, with a sunset date. An excise tax exemption will encourage fuel distributors to purchase cellulosic ethanol when available, and minimize the risk associated with investments in cellulosic biofuel companies.
2. Conduct rigorous benefit-cost analysis of prospective financial support policies for the biofuels industry, comparing benefits (including greenhouse gas reduction, employment gains, energy security, and tax revenues from economic development) with costs (including environmental impacts, state budget costs, and consumer/business expenses.)
3. Subject to state budget constraints and the lifecycle environmental and greenhouse gas criteria discussed in Chapter 2, consider the use of production tax credits and other tax incentives targeted at advanced biofuels production and commercialization, in those cases where analysis shows that projected benefits exceed costs. To better assist pre-profit and not-for-profit firms, study the implications of making tax credits refundable or transferable.
4. Subject to budget constraints, consider the costs and benefits of implementing state tax credits for the production of in-state biofuel and biomass feedstocks from sustainably managed forests and the cultivation of energy crops. Benefits to be considered should include stimulating investment in forestry and agriculture, improving the market demand and competitiveness of these feedstocks relative to residue sources of woody biomass, and maintaining and improving the Commonwealth's working landscapes. (See discussion in Chapter 3.)
5. Subject to budget constraints, authorize state funding for research in partnership with private companies and universities to improve existing technologies for converting wastes, including cranberry and other agricultural residues, to carbon-reducing, environmentally beneficial fuels. Before putting such technologies to work on a wide scale, however, subject the diversion of waste products for biofuels to full environmental and economic analysis. (See discussion in Chapter 3.)
6. Subject to state budget constraints and to lifecycle environmental and greenhouse gas criteria, create a fund that would provide grants and loans to attract advanced biofuels R&D, demonstration, and production facilities to locate in the Commonwealth in those cases where analysis shows that projected benefits exceed costs.
7. Financial incentives for producers and consumers of biofuels should be phased out with implementation of a Low Carbon Fuel Standard, since the standard will provide durable incentives to achieve greenhouse gas reductions and displacement of petroleum fuels at the lowest cost to consumers. However, R&D incentives may have a longer-term role in state support for the industry.
8. Include biofuels in priorities for state-level research on renewable energy, presumably associated with a state college or university. This educational institution should take the lead in identifying and pursuing federal funding in collaboration with biofuels companies.

Chapter 6 Endnotes

1. Note that in the federal energy law, “advanced biofuels” are those which yield lifetime greenhouse gas reductions of 50% or more compared to fossil fuels. Since estimates of these reductions are in early stages of development, we do not yet know which biofuels will qualify. In particular, soy-based biodiesel would meet this threshold if impacts on land use changes are not included or turn out to be small, but may not qualify as “advanced” if substantial land use impacts are included.
2. See Energy Efficiency and Renewable Energy Division of U.S. Dept. of Energy, http://cta.ornl.gov/bedb/biofuels/Major_Federal_Biofuel_tax_incentives.xls
3. See Section 202, Renewable Fuel Standard, in Title II of the Energy Independence and Security Act of 2007.
4. “Title II—Energy Security Through Increased Production of Biofuels, of HR6, Energy Independence and Security Act of 2007; see also “Federal Energy Independence & Security Act of 2007,” Brooke Coleman, New Fuels Alliance, Jan. 31, 2007.
5. “Custom Query” extraction from database of Alternative Fuels & Advanced Vehicles Data Center, U.S. Department of Energy.
6. From database of state biofuels incentives, developed by Economic Development Research Group for Massachusetts Advanced Biofuels Task Force, version as of 2/14/2008; also see the database of the federal Department of Energy’s Alternative Fuels & Advanced Vehicles Data Center.
7. Personal communication, 2/25/2008.
8. “Clean, Secure Energy and Economic Growth: A Commitment to Renewable Energy and Enhanced Energy Independence,” The First Report of the Renewable Energy Task Force to Lieutenant Governor David A. Paterson, State of New York, Feb. 2008.
9. “Clean, Secure Energy and Economic Growth: A Commitment to Renewable Energy and Enhanced Energy Independence,” Feb. 2008.
10. See, for example: “Ethanol and the Local Community,” John Urbanchuk and Jeff Kapell, AUS Consultants and SJH Company, 2002; “The Economic Impact of Ethanol Plants in South Dakota,” Randall M. Stuefen, 2005; “Contribution of Biofuels Industry to the Economy of Iowa,” James Urbanchuk, 2008.
11. “The Economic Impact of the Demand for Ethanol,” Michael K. Evans, Northwestern University, 1997.
12. “Contribution of the ethanol industry to the economy of the United States,” John Urbanchuk, prepared for the Renewable Fuels Association, Feb. 20, 2008, page 6.
13. “Contribution of the ethanol industry to the economy of the United States,” John Urbanchuk, page 5, Appendix Table 1 in the document shows national-level multipliers for economic sectors related to biofuels, and it appears that the author applied these multipliers to state-level economic output.
14. “Economic Impact of the Ethanol Industry in Minnesota,” Agricultural Marketing Services Division, Minnesota Department of Agriculture, May 2003, www.mda.state.mn.us; rough employment multipliers by sector from the IMPLAN model for Massachusetts, provided by Economic Development Research Group, February 2008.
15. “Using Tax Expenditures to Achieve Energy Policy Goals,” Gilbert Metcalf, Tufts University, National Bureau of Economic Research Working Paper W13753, Jan. 22, 2008.
16. “Biofuels: is the cure worse than the disease?,” Richard Doornbosch and Ronald Steenblik, Round Table on Sustainable Development, Paris: Sept. 11-12, 2007, Organisation for Economic Cooperation and Development, SG/SD/RT (2007)3, Table A, page 7.
17. “Massachusetts bioenergy initiative requires restructuring to ensure energy market neutrality and cost efficiency,” Doug Koplow, Earth Track, 2/28/08, page 6. Subsidies of \$2/gallon of biodiesel equate to about \$200/ton of CO₂ contained in petroleum diesel fuel.